Polystyrene scaffolds based on microfibers as a bone substitute; development and in vitro study

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Mots-clés	Cell culture [5], Electrospinning [6], Fibers orientation [7], Microfibers [8], polystyrène [9]
Résumé en anglais	We created non-resorbable porous scaffolds of polystyrene by electrospinning usable as a bone grafting material. Aligned and random fibers were prepared with a diameter ranging from 1 to 4.5 μm. Influence of microfiber diameter and alignment were determined by culturing MC3T3 osteoblast-like cells and evaluation of adherence, proliferation and differentiation at day 14 and 28 on the scaffolds. Scanning electron microscopy (SEM), nanocomputed tomography (nanoCT) and confocal microscopy were used to observe microfibers and morphology of cells seeded on the scaffolds. Nile Red was used to label the fibers, DAPI for nuclear staining and calcein for the calcium/phosphate deposits. MC3T3 were more adherent on the randomly distributed fibers having the highest diameter. MC3T3 proliferated equally on scaffolds made with aligned fibers but cell density was lower on random fibers with the smaller diameter. Alkaline phosphatase activity (a marker of osteoblastic differentiation) was not influenced by the fibers apart from on random fibers with the smallest diameter. Calcospherites also developed at the surface of the fibers in long term culture. Cytometric determination of the nuclei shape factors evidenced that cells were elongated along the main direction of fibers only on the aligned fibers. This study shows that porous scaffolds based on microfibers allow adhesion, spreading, orientation and proliferation of cells.
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